

## **§ 77.504**

trailing cables shall meet the minimum requirements for ampacity provided in the standards of the Insulated Power Cable Engineers Association—National Electric Manufacturers Association in effect when such cables are purchased.

### **§ 77.504 Electrical connections or splices; suitability.**

Electrical connections or splices in electric conductors shall be mechanically and electrically efficient, and suitable connectors shall be used. All electrical connections or splices in insulated wire shall be reinsulated at least to the same degree of protection as the remainder of the wire.

### **§ 77.505 Cable fittings; suitability.**

Cables shall enter metal frames of motors, splice boxes, and electric compartments only through proper fittings. When insulated wires, other than cables, pass through metal frames, the holes shall be substantially bushed with insulated bushings.

### **§ 77.506 Electric equipment and circuits; overload and short-circuit protection.**

Automatic circuit-breaking devices or fuses of the correct type and capacity shall be installed so as to protect all electric equipment and circuits against short circuit and overloads.

#### **§ 77.506-1 Electric equipment and circuits; overload and short circuit protection; minimum requirements.**

Devices providing either short circuit protection or protection against overload shall conform to the minimum requirements for protection of electric circuits and equipment of the National Electric Code, 1968.

### **§ 77.507 Electric equipment; switches.**

All electric equipment shall be provided with switches or other controls that are safely designed, constructed, and installed.

#### **§ 77.508 Lightning arresters, ungrounded and exposed power conductors and telephone wires.**

All ungrounded, exposed power conductors and telephone wires shall be equipped with suitable lightning ar-

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resters which are adequately installed and connected to a low resistance grounding medium.

#### **§ 77.508-1 Lightning arresters; wires entering buildings.**

Lightning arresters protecting exposed telephone wires entering buildings shall be provided at the point where each such telephone wire enters the building.

### **§ 77.509 Transformers; installation and guarding.**

(a) Transformers shall be of the totally enclosed type, or shall be placed at least 8 feet above the ground, or installed in a transformer house, or surrounded by a substantial fence at least 6 feet high and at least 3 feet from any energized parts, casings, or wiring.

(b) Transformer stations shall be enclosed to prevent persons from unintentionally or inadvertently contacting energized parts.

(c) Transformer enclosures shall be kept locked against unauthorized entry.

### **§ 77.510 Resistors; location and guarding.**

Resistors, heaters, and rheostats shall be located so as to minimize fire hazards and, where necessary, provided with guards to prevent personal contact.

### **§ 77.511 Danger signs at electrical installations.**

Suitable danger signs shall be posted at all major electrical installations.

### **§ 77.512 Inspection and cover plates.**

Inspection and cover plates on electrical equipment shall be kept in place at all times except during testing or repairs.

### **§ 77.513 Insulating mats at power switches.**

Dry wooden platforms, insulating mats, or other electrically nonconductive material shall be kept in place at all switchboards and power-control switches where shock hazards exist. However, metal plates on which a person normally would stand and which are kept at the same potential as the grounded, metal, non-current-carrying

parts of the power switches to be operated may be used.

**§ 77.514 Switchboards; passageways and clearance.**

Switchboards shall be installed to provide passageways or lanes of travel which permit access to the back of the switchboard from both ends for inspection, adjustment or repair. Openings permitting access to the rear of any switchboard shall be guarded, except where they are located in buildings which are kept locked.

**§ 77.515 Bare signal or control wires; voltage.**

The voltage on bare signal or control wires accessible to personal contact shall not exceed 40 volts.

**§ 77.516 Electric wiring and equipment; installation and maintenance.**

In addition to the requirements of §§ 77.503 and 77.506, all wiring and electrical equipment installed after June 30, 1971, shall meet the requirements of the National Electric Code in effect at the time of installation.

**Subpart G—Trailing Cables**

**§ 77.600 Trailing cables; short-circuit protection; disconnecting devices.**

Short-circuit protection for trailing cables shall be provided by an automatic circuit breaker or other no less effective device, approved by the Secretary, of adequate current-interrupting capacity in each ungrounded conductor. Disconnecting devices used to disconnect power from trailing cables shall be plainly marked and identified and such devices shall be equipped or designed in such a manner that it can be determined by visual observation that the power is disconnected.

**§ 77.601 Trailing cables or portable cables; temporary splices.**

Temporary splices in trailing cables or portable cables shall be made in a workmanlike manner and shall be mechanically strong and well insulated. Trailing cables or portable cables with exposed wires or splices that heat or spark under load shall not be used.

**§ 77.602 Permanent splicing of trailing cables.**

When permanent splices in trailing cables are made, they shall be:

- (a) Mechanically strong with adequate electrical conductivity;
- (b) Effectively insulated and sealed so as to exclude moisture; and,
- (c) Vulcanized or otherwise made with suitable materials to provide good bonding to the outer jacket.

**§ 77.603 Clamping of trailing cables to equipment.**

Trailing cables shall be clamped to machines in a manner to protect the cables from damage and to prevent strain on the electrical connections.

**§ 77.604 Protection of trailing cables.**

Trailing cables shall be adequately protected to prevent damage by mobile equipment.

**§ 77.605 Breaking trailing cable and power cable connections.**

Trailing cable and power cable connections between cables and to power sources shall not be made or broken under load.

**§ 77.606 Energized trailing cables; handling.**

Energized medium- and high-voltage trailing cables shall be handled only by persons wearing protective rubber gloves (see § 77.606-1) and, with such other protective devices as may be necessary and appropriate under the circumstances.

**§ 77.606-1 Rubber gloves; minimum requirements.**

(a) Rubber gloves (lineman's gloves) worn while handling high-voltage trailing cables shall be rated at least 20,000 volts and shall be used and tested in accordance with the provisions of §§ 77.704-6 through 77.704-8.

(b) Rubber gloves (wireman's gloves) worn while handling trailing cables energized by 660 to 1,000 volts shall be rated at least 1,000 volts and shall not be worn inside out or without protective leather gloves.

(c) Rubber gloves shall be inspected for defects before use on each shift and at least once thereafter during the shift when such rubber gloves are used